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RECORD OF ORAL HEARING

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

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Ex parte CRAIG S. CALVERT, GLEN W. BISHOP,
YUAN-ZHE MA, TINGTING YAO,
J. LINCOLN FOREMAN, KEITH B. SULLIVAN,
DWIGHT C. DAWSON, and THOMAS A. JONES

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Appeal 2008-0483
Application 09/934,320
Technology Center 2100

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Oral Hearing Held: February 19, 2008

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Before LANCE LEONARD BARRY, HOWARD B. BLANKENSHIP, and STEPHEN C. SIU, *Administrative Patent Judges.*

ON BEHALF OF THE APPELLANTS:

MATTHEW T. SHANLEY, ESQ.
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The above-entitled matter came on for hearing on Tuesday, February 19, 2008, commencing at 1:37 p.m., at the U.S. Patent and Trademark Office, 600 Dulany Street, 9th Floor, Hearing Room A, Alexandria, Virginia, before Kevin Carr, Notary Public.

P R O C E E D I N G S

MS. BOBO-ALLEN: Calendar Number 32, Appeal Number 20080483.

JUDGE BARRY: Good morning, counsel.

MR. SHANLEY: Good afternoon, Your Honors.

JUDGE BARRY: We have about 20 minutes. We'll set the time whenever you're ready.

MR. SHANLEY: Okay. My name is Matt Shanley. I'm a corporate patent counsel with ExxonMobil's Upstream Research Company. It's the real party in interest in the present case. I want to thank you for allowing me the time and the opportunity to present the case today. Before I get started, is there any particular question or area that you would like me to focus on rather than just jumping into the sort of presentation that I had in mind.

JUDGE BARRY: Yes, counsel. The rules 4137C(1) requires that the summary of the invention in the brief references the figures by reference character and helps us more quickly identify the invention. And that wasn't done here. There were just referenced figures in general.

MR. SHANLEY: And they didn't have element numbers, you mean. Is that what you're saying?

JUDGE BARRY: Exactly. So, if you could go ahead and do that for us, that would be a help.

MR. SHANLEY: Sure.

JUDGE BARRY: For instance, in claim 1, the first two elements are mapped against "see figures 2, 3 and 5a," which isn't a lot of specificity.

MR. SHANLEY: And it's a broad range of figures too. Let me answer your question and if it's not sufficient I'll follow-up. But, perhaps I can do it this way. Figures 1, 2 and 3 show some aspects, and what I can do is walk you through claim 1 and show you generally what's going on here.

JUDGE BARRY: Claim 1 and then claim 2.

MR. SHANLEY: And if that doesn't sufficiently point it out, please tackle me and let me know. Well, I'll use claim 1 as the example here. So we have a method for constructing three-dimensional, geologic model of the subsurface earth volume. The first step in doing this is generating an initial frequency pass-band model of the sub-surface earth volume for at least one frequency past-band.

Now, figure 1 is really only useful in that it just demonstrates what we mean by a frequency pass-band. And this might be something that you might do in telecommunications, but you have spectra that show up at a low frequency pass-band, sort of a mid-range here, which corresponds to the seismic range that we deal with and then an upper range here that's shown.

But what we're doing when we say generating an initial frequency pass-band model, and the word model I think is particularly important here, is if you go to figure 2 now, we have examples of two models that are here. The first one is a low frequency pass-band model. And this happens to be of a particular rock property. In this case, it's a model of shale fraction for the earth at that position. Now we have a high frequency pass-band model of the same property, again, shale fraction.

But there are two discrete models that we have here and those are models that can have the one thing that's a common denominator for them. They might rely on seismic spectrum in order to be formed, but the result is

that you have an actual rock property that's associated with a volume within the sub-surface. So that's the first step there.

JUDGE BARRY: So what would be an initial frequency pass-band model?

MR. SHANLEY: It could be either one of those two would be an initial one. And, in fact, let me just briefly, in step B we have assigning values for at least one rock property in each initial frequency pass-band model. And what you have here, that would be the shell fraction that we're dealing with. So we would apply or assign a shell fraction for each one of these models to therefore model that rock property.

C is the next, I would say, important step, particularly in light of the rejections that we're facing here. It's the combining, the initial frequency pass-band models. And, what we have here is the example, looking at figure 2 again, would be the low frequency pass-band model and a high frequency pass-band model to form an initial complete, three-dimensional, geological model of the sub-surface earth volume.

So, figure 2, again, I think probably best graphically shows what we're doing here. Figure 3, that step would correspond to 114 on figure 3.

JUDGE BARRY: Okay. And it's figure 2?

MR. SHANLEY: Generally, there.

JUDGE BARRY: Figure 2 corresponds to the addition?

MR. SHANLEY: Figure 2 would visually show the fact that you're taking the two models that you're starting with the combine. The output would be 5a would show the process step of 210, and that's just combining the initial frequency models.

JUDGE BARRY: Okay.

MR. SHANLEY: So, let me clarify again. So we start with the low frequency pass-band models, let's say the first of the models that we're combining. We have a mid frequency that's listed in here, and a high frequency. So there's three potential ones that are being combined. And the lower right-hand corner of the four screen shots that you have is the result. That's the complete model of shell fraction.

But an important thing to take away from each one of these is that each one of the three screen shots to the upper left, where the low frequency, mid-frequency and high frequency, they're not just data volumes, but they're actually models at this point, so they actually have the rock properties associated with them. So, independently, the low frequency pass-band model is a model of shale fraction at that frequency. The mid-frequency is a model of shale fraction at that frequency and so on. You then sum those three or combine those three together.

It's really a simple summation if you're dealing with low, medium and high that don't overlap. If there's some overlapping, then we discuss that there's some additional things that you might do as far as weighting each one of the models. But the combination is graphically represented by that lower right-hand corner screen shot.

JUDGE BARRY: Okay, and elements A and B? Where would those correspond to in Figure 3?

MR. SHANLEY: Elements A and D?

JUDGE BARRY: A and B.

MR. SHANLEY: Well, the generating of it would be your output that you would have. You know, the low frequency pass down model?

JUDGE BARRY: No. In figure 3?

MR. SHANLEY: Oh, on figure 3. I'm sorry. Well, figure 3 shows sort of a flow of it, but we have a combination of generating and really assigning the two of these. So A and B would really be shown in 111 more than anything.

JUDGE BARRY: Okay.

MR. SHANLEY: And then if you really want the discrete process, the steps themselves are better shown in 5A, but that's just a flow chart, so.

JUDGE BARRY: Okay, and then step D?

MR. SHANLEY: Step D is this optimization process, so if we go back up to step C and the output that we had was this combined model of rock property, we now optimize it, and optimization, the process that's described here is perturbing the rock property value.

So what you oftentimes you have this shale fraction that we have in figure 2. You will then go back. The idea is to compare almost an empirical data set or perhaps an observed data set with calculated results and you're going to tweak one of the variables here, and then go back and iterate and see whether not the results match. And so you intentionally do this until you get a match that's so close that it's desirable, and now you've optimized this process.

So, graphically, that's not necessarily shown in figure 2. It's because it's really screen shots of the actual model, but that can happen in several ways, process, Step D.

JUDGE BARRY: Is it shown in any of the figures, figure 3?

MR. SHANLEY: Well, as far as showing, it would have to be more of a result.

JUDGE BARRY: Well, I don't mean showing it. I mean one of its characters.

MR. SHANLEY: Yeah, figure 4 is directed at the idea of perturbing values.

JUDGE BARRY: Okay.

MR. SHANLEY: It's a simplified version, and as far as corresponding, I could point to additional paragraphs in the specification if I had my hands on it too.

JUDGE BARRY: Well, it's good to claim 18 then, the way you've got it claimed?

MR. SHANLEY: All right. Okay. So we have the method for constructing, again, a three-dimensional geological model. We have specifying the initial geologic architecture to define the limits of the model; and, so, that's not going to be shown graphically as far as specifying them, but really, A, you specify an initial geological architecture, creating a three-dimensional array of contiguous model blocks to represent all portions of the volume. The result is each one of the screen shots you see in figure 2, so it's specifying and creating the array is more difficult thing to show. But the results are each one of those models, the low I and mid-frequency, each one being their own model.

Again, when we get down to step D, which is combining the models and then that's similar to claim 1 up above, E, F and G, you're dealing with specifying training criteria for the initial model, calculating the statistics, describe the characteristics of these rock property values and calculating the initial objective function, again perturbing, calculating the objective

function. I am going to run through each one of these, then sum them all together for you.

Retain the perturbed rock property values and the new tentative objective function. And then we have this repeating steps. This is the iteration I am talking about. Each one of those would be shown in figure 3, sort of expands and you consider that an iterative loop and it's sort of at the center of the figure, 114, 116, 118, 112. You have sort of that process that's going on. Figure 4 talks about perturbation of the values.

Figure 5 is more generic to the model as a whole, but you have figure 5B gets them to more granular with respect to the details of claim 18 there, more specifically, steps E through J, and outputting the final, complete, geologic model to file. It would be very similar to what you see on figure 2, the lower right-hand corner, but it may be slightly different if it's been optimized.

So those would be each element of those. Does that sufficiently answer what you were looking for?

JUDGE BARRY: Yes.

MR. SHANLEY: Okay. And since we've run through the claim here, I can direct you to, with looking at maybe figure 2 in our application and then I'll refer to figure 8A of the primary reference that the Office has relied upon. It ends in '759. It's the Etgen reference. I believe it's also repeated in the examiner's answer and a copy of the same screen shot.

JUDGE BARRY: The examiner seems to rely on figure 3A, not — as opposed to figure 8A, doesn't he?

MR. SHANLEY: I'll pull that one out as well, but we'll keep 3A and 8A side-by-side. And 8A adds a little bit more, I think, visually to show

what's going on. And, most importantly, it shows what is meant by a velocity model. And so, you are correct, yeah. 3A is what was shown in the examiner's answer.

JUDGE BARRY: Right. The examiner reproduces 3A and 3B in his answer. So it's probably one that we should try to distinguish.

MR. SHANLEY: We'll stick to 3A and I'll reference on the 8A just to show visually what in fact we can start there. We have in 8A the only reason I really wanted to bring that up was to show what a velocity model is. In this case, it's a three-dimensional representation of the earth's sub-surface.

You have x-y coordinates, so you're looking at the earth down. So you're horizontal components, and then you have a depth component heading or the z-axis that we have. The property that's modeled in that model is velocity, so it's as the name states. It's a velocity, so it's as the name states as a velocity model. In contrast, and perhaps it might be the source of some confusion during the prosecution here was that we are dealing with a frequency pass-band model, and it appears that the office may be equating the fact that we say frequency pass-band model, that the model is modeling frequency pass-band, but that's not the case.

The frequency pass-band is a way that the data is looked at. In this case, in figure 2, shale fraction is the property that's actually modeled here. A frequency pass-band model is a way of modeling shale fracture, and so you can have a different story told about shale fraction, depending on which one of these frequency pass-band models you select. And so the Office has equated the velocity model.

JUDGE BARRY: Counsel, you should refer to what the examiner has done rather than the Office.

MR. SHANLEY: Well, I'm sorry, yeah, the examiner. The examiner has equated the velocity model, and I think more particularly in the examiner's answer he clarifies that you start with a velocity model. The property that is assigned, which would correspond to our step B in claim 1 is velocity in the examiner's velocity model. Then the next step is we have this process of combining models together. What the examiner has equated in figure 3A, and visually you would look at on the right-hand side. I guess it does have. It has an x, y and now a t component, which is the time.

You could either have x- y time, or x-y depth, either one, but it would both be a three-dimensional view of this. But what the Etgen reference then does is it does a three-dimensional Fourier transform here. In some of these other embodiments it does 2D and 1D, etcetera. One might say that you have a block that starting with in the upper right-hand corner is an off-set volume at this point. So on the left-hand side of figure thread, you actually started with a model of a rock property. And what you're doing in the process of this technique of migration is you are now down to just the data set. It is no longer an actual model of properties at this point.

And that's best demonstrated if you go down to the next step, the 3D Fourier transform produces. You now see what the spectrum has been reduced to. You have coordinates, x and y, but now you have w or frequency becomes now the z component that you have. And so you've lost that third spatial component that we have, and you are now in a different domain. And the interesting thing about, what the real sort of disagreement that we've had between the examiner and us is whether or not these

frequency slices, and then the recombination of these, can be equated to what we are doing here with combination of models. And what you see over and over in the briefs is that we're saying that frequency slices by themselves are not models.

JUDGE BARRY: Where do you see that in the brief, counsel?

MR. SHANLEY: Sure.

JUDGE BARRY: I certainly see "distinguishing frequency model from the velocity model." Of course, the examiner admits they are not the same.

MR. SHANLEY: And I think in the examiner's answer is where we get closer to clarification. Let me refer to that.

JUDGE BARRY: And if the examiner's answer, which was October 20th of '06, on page 4 regarding claim 1, when the examiner is characterizing the Etgen reference, it talks about the step of generating an initial frequency pass-band model of the sub-surface earth vine for at least one frequency pass-band, as taught by Etgen as at least one frequency slice, whereas multiple slices are disclosed.

JUDGE BARRY: Right. So, the examiner's position in figure 3A to say that middle slice, say, frequency slice omega n would be.

MR. SHANLEY: Well, actually, yeah, and two of them too. Because what you've done here is if you look up above, that complete volume has been broken up into individual slices and so he hasn't just had one. He has had two. And so at least structurally, it looks as if you're taking two discrete elements and then combining them as we state in claim C. And I am not disagreeing with them there. The issue becomes more to what a frequency

slice is at that point, and if you then look at each one of those slices, and I'll refer to Etgen itself.

JUDGE BARRY: Okay. That's what I wanted to get at.

Where does your brief address that specific point that a frequency slice is not a--

MR. SHANLEY: Okay. I'll refer to the reply brief we filed. And the second paragraph that we started with her and it states -- and I don't know if you would consider it to be conclusory -- but it's stating that the assignment of rock properties to a velocity model and the subsequent conversion of the velocity model into frequency slices corresponds to assigning values for at least one rock property at each initial pass-band model.

JUDGE BARRY: I'm really just trying to map them, counsel.

What page were they before?

MR. SHANLEY: I'm sorry, page 2.

JUDGE BARRY: Okay, page 2, paragraph?

MR. SHANLEY: Paragraph 2 is where we sort of repeat what the examiner said in frequency slices, and then we come down with appellants' method of frequency pass-band model is not a model of velocity or of frequency. Again, it is noted in the appeal brief it is a model of some property of the sub-surface that is limited in frequency band width. So in Etgen, the frequency slices represent amplitude data that is limited in frequency content but not velocity.

JUDGE BARRY: Okay. And you cite what part of Etgen?

MR. SHANLEY: Column 17, lines 28 through 63.

JUDGE BARRY: Okay, let's turn to that.

MR. SHANLEY: Okay, sure.

JUDGE BARRY: And where does Etgen, column 17, lines 28 through 63, explain that, what the frequency slices represent amplitude data that is limited in frequency content?

MR. SHANLEY: Okay, 28 through 63, this is talking about two things here. The first is the velocity model, itself, and how it is layered.

JUDGE BARRY: Right.

MR. SHANLEY: Yeah, and also, it's the second paragraph in that same citation. So we have those discussions here and in general be in terms of a layered model. And it might be confusing on how that was cited in the reply brief too, but that's probably better emphasizing the fact that the frequency slices represent amplitude data that is limited in frequency content, not velocity.

And, really, what that citation positively states is that it is limited in velocity. So, perhaps, that is not a direct corollary to what we've written in there in the reply brief, but what Etgen positively states there is that a velocity model contains constant velocity at each one of its blocks. So perhaps it's an inference there that draws or relates. It's not really a direct cite, I guess.

JUDGE BARRY: The paragraph more specifically teach that velocity is limited in the velocity model?

MR. SHANLEY: Well, because that's what a velocity model is. It's looking at just velocity in that case; and, really, I think getting to your point about where we talk about frequency slices, it's discussed in more detail at other portions within this as well. It's not within 28 or 63, though. It doesn't really get to just frequency slices. I can point to that though.

JUDGE BARRY: Well, if it was in your brief.

MR. SHANLEY: Are we out of time?

JUDGE BARRY: Yeah. Was it in your brief? If there's somewhere in your brief that you can point to and we can consider it, but we are bound to only what was argued in the briefs.

MR. SHANLEY: Okay.

JUDGE BARRY: And I thought your reply brief did get to an attempt to more specifically address the examiner's position, probably because the answer got through his position more specifically. But I, too, counsel, had that problem. I didn't see column 17, lines 28 through 63, teaching what you cited it here for.

MR. SHANLEY: Well, okay, and the follow-up to that was the next paragraph down as far as frequency slices, though. And we have Etgen then that then deals with there's two citations. You have column 5, line 40, column 7, line 35.

JUDGE BARRY: Where is that in your brief?

MR. SHANLEY: In Etgen. It's on page 3, the citation there.

So we expand on some of the additional citations in Etgen that deal with frequency slices here and how they equate really following that process in figure 3A.

JUDGE BARRY: Right. Column 5, line 40 through column 7, line 30, basically being an overview of the summary of the invention.

MR. SHANLEY: Right, and to that end, with what you have in that frequency in frequency slices is you have this x-y component, or the kx-ky. But when you do those frequency slices, what you are left with are not individual rock properties that are in those slices. And now you are left

with transform coefficients, because you are not dealing with a model at that point. You are dealing with a data volume that's been broken up.

So the contrast to an actual model that has a physical rock property, the slices that you are dealing with here, their so-called property would be transformed coefficients at that point, which aid the ability to then output a composite data spectrum. But if you will see at the end of figure 3A, they're talking about a migration technique, and a model is not physically output here. In order to take this next step, you would have to invert that Fourier transform back in order to create an actual volume or a model at that point.

So our main position here with respect to the examiner's rejection is that the frequency slices here themselves don't model rock property. What they actually contain are transfer coefficients. What we show in ours is that it's an actual physical rock property.

Thank you for your time. I appreciate it.

JUDGE BARRY: You're welcome.

[The hearing was concluded at 1:59 p.m.]

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